solplan review

the independent newsletter of energy efficient building practice

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INSIDE....

Much effort is going into developing new techniques for low energy building - mostly for new construction. However, a major challenge is what to do with already built houses which will be with us for some time. Upgrading and retrofitting of these houses will be the major growth area in residential construction.

A demonstration program in Manitoba gives us an indication of cost effective options to pursue in retrofitting. Problem areas include a lack of understanding on the part of owners and contractors.

In recent issues we have talked about Canadian energy standards. We provide a review of what is going on in Scandinavia. Led by Sweden, with a research budget double ours, they are about to overtake Canada at the forefront of low energy building technology.

Grilles and diffusers are an important component in ventilation systems. We review factors to consider and a new grille now on the market.

Other stories include comments on the R2000 program national marketing; results of a study on ventilation and formaldehyde in tight houses; alternate framing techniques; contract language to use if not building within R2000; publication reviews, and more.

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APPROPRIATE RETROFITS

FROM THE PUBLISHER

We as Canadians tend to lack self confidence in our abilities. There is no lack of talent in this country. We have invented and produced many significant new and innovative products, whether it's the lowly paint roller or the first commercial jet airliner. Yet we seem to lack the capacity or will to carry a new idea to a marketable stage.

We start work on innovations, but when we realize that no one else is doing it (often because it is a breakthrough) we give up, only to let someone else take over. Then we import the technology back into Canada.

We may be at the stage where we loose our dominant position in the low energy building field due to a lack of conviction, commitment, and financial support. What is needed now is a greater effort into research, development and marketing, so that we can benefit from Canadian technology now, rather than waiting to reimport it later.

When we started planning SOLPLAN REVIEW, a common question we were asked was "is there enough to write about?" As we finish the first year, we are finding the problem is one of too much material - not a shortage.

If we were to do nothing but deal with issues raised by you, we would have more than a year's worth of material. There is considerable activity going on in the field in Canada, but it is not being communicated. Often, few outside a select group participating in a project know about it. As we suspected when we launched this publishing venture, there is an information void waiting to be filled. We are trying to fill it.

RKadulski

Richard Kadulski

READER SURVEY

We would like to thank all who responded to our recent reader survey questionnaire.

You have given us a good indication of who our audience is, the value you place on our efforts to date, as well as suggestions on how to improve. Most of you are looking for technical information, construction details, and objective new product information.

We were flattered to be compared by some to Fine Homebuilding Magazine. We do not have the financial resources to turn out that kind of product. However, we will pursue our goal to provide clear, concise, current and unbiased information.

We will follow up on your suggestions for information you need, and will try to continue improving on our work to date.

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RETROFITTING FOR ENERGY EFFICIENCY

Most of the houses which will exist in the year 2000 have already been built - and most are energy slums. Built at a time when energy conservation was not an issue, good insulating materials were not available or appreciated, they are energy inefficient, drafty, uncomfortable, and hard to keep warm.

Upgrading and retrofitting of these houses is, we believe, the major growth area in residential construction.

What measures are appropriate or cost effective? There are as many different options as there are houses. The recently completed Manitoba Energy Demonstration program found that homeowners and contractors displayed a poor understanding of the proper design of energy conservation retrofits. Many had difficulty identifying and priorizing the most cost effective retrofit alternatives.

The objectives were to provide a public demonstration of residential retrofit alternatives; to evaluate the technical and practical aspects of residential energy conservation; and to determine the understanding of residential energy conservation issues by the public and contractors.

83 houses were selected for comprehensive retrofits. The total predicted energy useage in the houses was to be reduced by a minimum of 40% (this included space heating, domestic hot water heating and appliance energy use). Each had to be reasonably cost effective.

Homeowners were invited to participate in the program. Energy audits were performed on approved applications to verify basic information, and to collect data to perform a HOTCAN computer program energy analysis on the proposed work. The simulations were to estimate their post retrofit performance.

A formal comparison between predicted pre-retrofit loads and actual utility records was not performed, but informal comparisons suggested that HOTCAN tended to over-predict space heating loads. This made savings attainable by retrofitting overly optimistic.

Most poorly understood was the relative cost effectiveness of various conservation measures. Homeowners often proposed inappropriate retrofit measures ignoring very cost effective options.

A classic example is the desire to replace existing doors and windows with new units, while ignoring uninsulated foundations. Some homeowners, realizing the dominance of heat loss though windows, believed that upgrading windows would produce major energy and dollar savings. Few understood the need to seal doors and windows, and the posibility of upgrading existing units.

Replacement of heating plants was not as frequently proposed as analysis indicates it should have been.

A very common belief was that heating systems, doors, and windows are inefficient by virtue of their age.

About 100 contractors were involved with the demonstration program. Their backgrounds varied. Some had taken a course on insulating houses for energy conservation, others had taken various courses and seminars from product manufacturers or distributors, others had little if any formal training in residential energy retrofit work.

Many contractors, especially those in general contracting, displayed a poor appreciation of the cost effectiveness of various energy conservation options.

It was also noted that few contractors or their sales representatives carefully examined the house prior to drawing-up detailed work statements, contracts or prices. In such cases, important assumptions were made about the condition of the house, and the work was carried out on that basis. In one case, exterior wall insulation was priced, because the owner thought there was no insulation. In fact, it was found that the walls were insulated.

Air sealing of houses was frequently recommended by contractors, even in cases where the house displayed obvious signs of inadequate natural infiltration.

Most contracts between homeowner and contractor did not contain contingency provisions to permit deviations if the original assumptions used to price the work were wrong.

Contractors relied on general information on energy conservation found in popular literature. They lacked the ability to estimate energy savings and dollar savings from specific retrofit measures. There was a tendency for some to

recommend only one solution, rather than considering a variety of alternatives which might be more attractive.

Few contractors displayed an understanding of the importance or significance of indoor air quality and potential backdrafting problems from combustion appliances. This may be because these areas do not fall within the domain of any one trade. This points to the need for a specialist energy contractor who provides a package deal, and who's team includes a variety of trades, or provides a consulting/coordinating service.

The program provided a valuable insight into the costs and benefits of residential energy conservation retrofits. Detailed monitoring results are not yet available to verify accuracy of predicted savings, but it is suspected that savings will be less than predicted since homeowners tend to operate their retrofitted houses at higher temperatures.

Table 1 lists the most commonly applied conservation measures, compared to proposed actions.

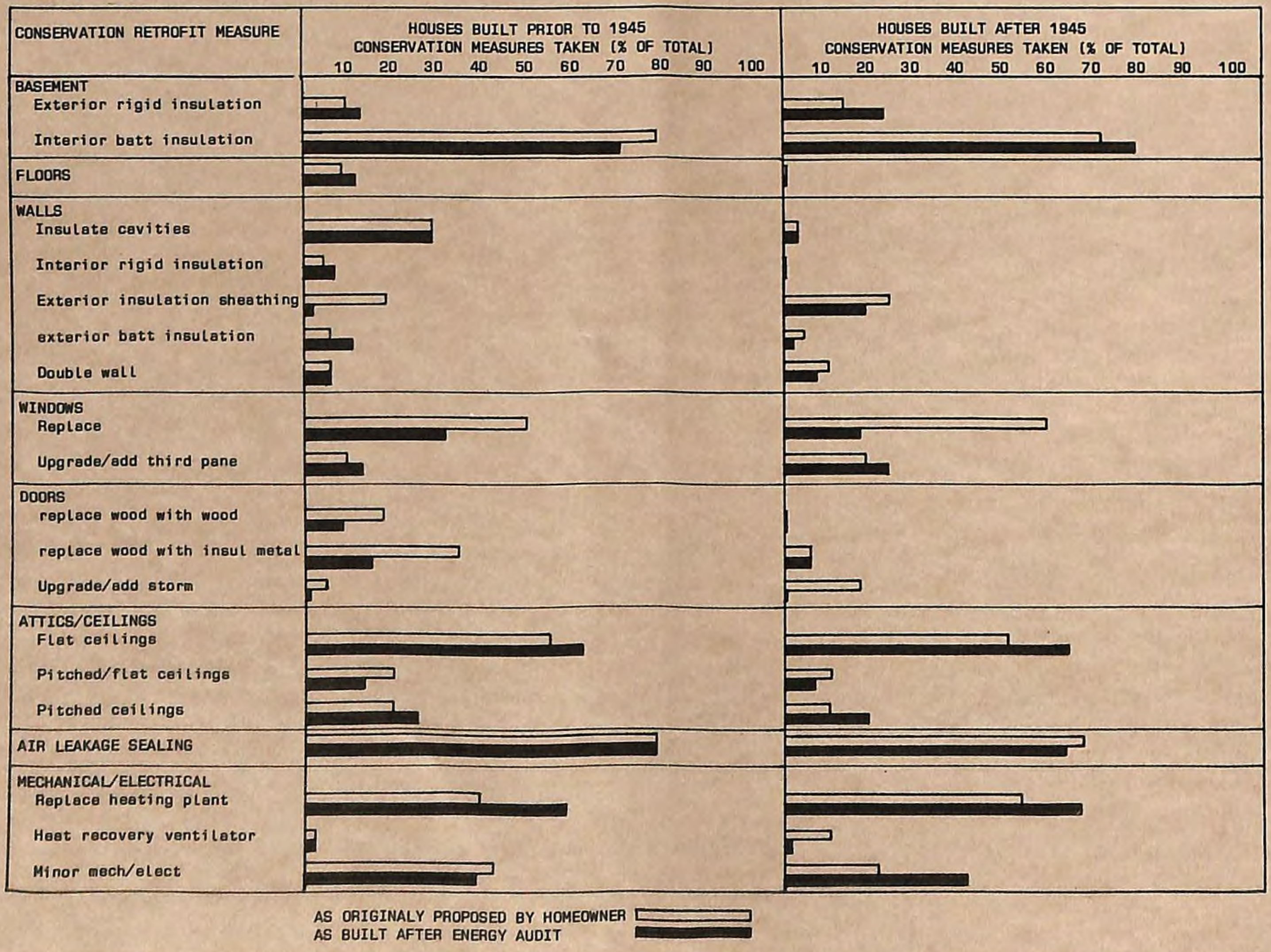
Differences in size, construction type, insulation levels, age, occupancy characteristics, location, and climate make it difficult to generalize about the best or most effective measure. The retrofits undertaken in the Manitoba program do not provide a definitive universal list of what is feasible or practical. However, many of the observations made in Manitoba should be considered in other regions.

FOUNDATIONS

Interior foundation retrofits were often found to be the most cost effective retrofit measures. The payback was generally quick.

Most commonly, basement walls were insulated with one or two layers of fiberglass batts between 2x3 or 2x4 stud

Table 1



walls. The batt insulation in such applications must be fit snugly against the foundation wall. A damproof layer (such as 6 mil polyethylene) applied against the inside face of the foundation wall minimizes moisture seepage into the insulation.

In some cases, rigid insulation was applied to the exterior of the foundation.

Side benefits of foundation retrofits include increased comfort level, improved appearance of basement space, and in some cases increased foundation stability. However, savings may be offset in some cases by the higher temperatures at which the basements may be maintained after the retrofit.

The most significant foundation retrofit problems may be the creation of cold floors along the main floor perimeter if header areas are not handled carefully, and increased difficulty in detecting foundation cracks or problems because of the cover of the insulation. Problems can also be encountered with insulating and sealing joist header areas.

EXTERIOR WALLS

Most houses were wood frame. Some evidence of moisture damage was found in a few houses; the most common cause was moisture penetration from the exterior. Mould or mildew was found on interior wall surfaces in some houses with low air change rates.

The cost effectiveness of insulating empty wall cavities was generally predicted to be good. Most other types of wall retrofit were considerably more expensive.

Interior and exterior wall refinishing dramatically improve the house appearance. Other than obvious visual improvement, some of the added cost can be recovered in the higher value of the house.

Retrofitting of exterior walls using other techniques such as application of rigid insulation, strapping, single or double walls was less cost effective. These retrofits were economical when the house was due for re-siding or the interior finish was in need of replacement.

Exterior wall retrofits require careful planning before work is carried out to consider: the possible need to relocate utility lines; inadequate roof overhangs to accomodate added wall thickness; lot setback limitations; structural detailing problems; existing insulation levels; possible fire hazards from application of exterior insulation around fireplaces and chimneys; poor patching of interior or exterior holes through which insulation is blown into cavities.

Wall retrofits included insulation of empty or partially empty wall cavities, exterior insulation (rigid or fiberglass between strapping), interior fiberglass (between interior strapping), and exterior double wall. Exterior wall retrofits were performed on half the houses. Generally, the work was intended to increase the insulation level and reduce air leakage.

Exterior wall retrofits were preferred because no disruption to interior living space occured, and the the useable living space was not decreased. If a new air/vapour barrier was installed over the exiting wall, better air sealing could also be achieved. However, window and door treatment must be carefuly considered.

On narrow lots, or where the house is built against setback limits, there may not be enough space to allow for the added thickness of wall.

WINDOWS

Virtually all types of windows were encountered, the most common being wood single-hung units with wood or aluminum exterior storm, aluminum sliders, non-operating sealed units, and sashless horizontal sliders. Most were double glazed.

The relative cost effectiveness of replacing double-glazed windows with new triple glazed units was extremely poor. Such retrofits were only warranted on aesthetic grounds or if the unit was physically in need of replacement.

Third pane storm window retrofits were much more cost effective than complete replacement, and were the most economical means of controlling window condensation.

Excessive air leakage through existing windows was most economically corrected using proper air leakage sealing techniques.

DOORS

In most cases, there were two doorways per house, each with an interior door and storm door. One of the doors often opened into an unheated front or rear porch. From

a structural and functional perspective, most doors were found to be in reasonably good condition.

Doors were found to be a major source of air leakage. Leakage was most common at the top and bottom and at the four corners. Weaterstripping was either non-existent or in very poor condition.

Replacement of existing doors in good or repairable condition with energy efficient units was not predicted to be cost effective.

Replacing existing doors with more energy efficient designs was marginally cost effective only when the existing units had to be replaced for other reasons.

Many doors which homeowners viewed as requiring replacement were successfully and economically retrofitted by proper weatherstripping and sealing.

ATTICS & CEILINGS

Most houses had insulation levels in the RSI 2 to 5 range. Some attics had previously been re-insulated, often with CHIP assistance. In a few cases, the extra insulation had been added without any attempt to air-seal the ceiling, thus creating the potential for long term moisture problems.

Additional venting was provided where necessary, but turbine vents were discouraged because of concerns that they would depressurize the attic and thus draw moisture-ladden air from the living space into the attic.

Contractors were often unwilling to bother with air leakage sealing because of the extra costs or a general disbelief in its need.

Attic retrofits in bungalows and 2 storey houses were relatively cost effective provided the initial insulation level was low. Attic and ceiling retrofits in split level and 1 1/2 storey houses were less cost effective. They were economical only when major interior renovations were being carried out to the upper levels of the house. Emphasis must be placed on sealing of the floor joist penetrations into the attic spaces behind the kneewalls.

Cathedral ceiling retrofits exhibited a relatively poor cost effectiveness and were best performed when other repairs, such as replacement of the shingles, were required.

Attic and ceiling retrofits must consider three steps to be successful: air leakage sealing, the addition of extra insulation and increased ventilation.

AIR LEAKAGE SEALING

The majority of houses received an airtightness test before and after the retrofit. The post retrofit tests measured the net change in airtightness due to all retrofit measures, not simply air leakage sealing measures. In many cases, the other measures had a significant impact on the air leakage rate.

A wide range of airtightness rates was found. Some houses (typically newer bungalows) were found to meet the R2000 airtightness standard. In others, the testers had difficulty generating enough pressure difference because the houses were so leaky.

Air leakage sealing was proposed by homeowners almost as frequently as it was found to be necessary by the energy audit. In some cases, sealing was added or deleted based on airtightness test results.

Homeowners occasionally proposed sealing even though the house exhibited visible signs of low natural air leakage (such as high humility levels). In other cases, houses with obvious need of major sealing were not recognized.

The relative cost effectiveness of air leakage sealing was very good, especially if the work was performed by the owner. However, contractors who specialized in air leakage sealing usually performed higher quality work than homeowners.

Higher comfort levels due to reduced drafts and better protection of the building shell due to reduced water vapour penetration were also anticipated.

Generally, contractors and homeowners did not understand the importance of maintaining an adequate air supply for combustion appliances. Indiscriminate air sealing could lead to serious problems with indoor air quality.

The general issue of maintaining acceptable indoor air quality is not well understood. Better guidelines, standards and testing procedures are needed by contractors, homeowners, and energy advisors to safeguard indoor air quality.

HEATING & VENTILATION SYSTEMS

Heating system replacements were a common retrofit measure. Ventilation system modifications were also common, but generally were included for reasons of safety or comfort.

Although detailed inspections were not performed, most furnaces appeared to be in a reasonable condition.

A complaint voiced by many homeowners was that some areas of their houses were cold during the winter months. Although this was mainly a problem of insulation and airtightness levels, it appeared that the heat distribution systems in many houses were poorly balanced. Most homeowners and some contractors displayed little understandi ng of the need to balance the systems. This was especially common in older houses with hydronic systems.

Upgrading of existing combustion heating plants with more efficient units was found to be most economical in houses with large space heating bills.

The relative cost effectiveness of replacing conventional natural gas furnaces with high efficiency units was predicted to be reasonably good. Since many of the existing units were near the end of their service life, the marginal cost effectiveness of upgrading to a more efficient furnace was even better. It generally made sense to select the most efficient unit.

Replacement of natural gas boilers with higer efficiency units was generally less cost effective than forced air furnace replacements because of the higher initial cost. Many existing units still had many years of useful life remaining.

Replacement of oil furnaces with electric or electric/wood combination units was reasonably cost effective, especially if the electrical service did not have to be upgraded, or if in the case of wood/electric conversions, an inexpensive source of wood was available.

Some installation practices for wood burning appliances observed created potential fire hazards.

Virtually all contractors and homeowners were unaware of the potential difficulty of supplying combustion air to tight houses. Contractors and homeowners were usually unaware of the need to provide adequate air supplies to combustion appliances to minimize potential backdrafting problems.

OTHER OBSERVATIONS

Energy conservation retrofits often require non-energy related work to ensure an effective job. Much of this is repair and maintenance work.

Using the data collected during the house visit, HOTCAN simulations were performed. However, the consultants were unable to obtain reasonable matches between HOTCAN results and actual energy bills. The HOTCAN simulations tended to overestimate actual energy loads, and thus the possible savings to be obtained from the retrofits.

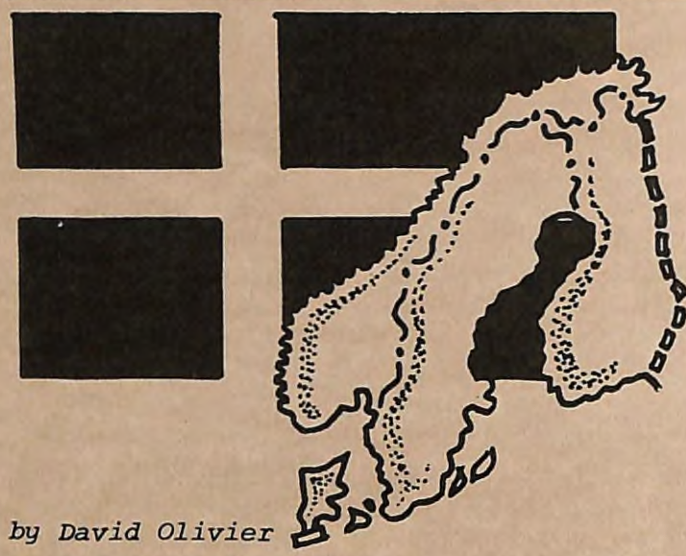
Significant simulation input errors may result from incorrect estimation of building component construction, component R-values, heating system efficiency, and actual indoor temperatures. It is thought this variation may be caused by variations in actual temperature differences across the building elements, and variations in actual temperatures in the houses (especially in cooler, less frequently used rooms).

The HOTCAN computer program was originally developed as a tool for predicting energy consumption of low energy houses. Because of the better heat distribution and more uniform conditions in new construction, they are more representative of actual conditions. In older houses, assumptions have to be made which are not always accurate. As a result, the accuracy reported for HOTCAN, determined largely by monitoring new low-energy houses, may not be applicable to older structures.

Further research is needed to determine the accuracy of HOTCAN for analyzing the heating loads of existing houses.

The major benefits of an energy audit to the homeowner appear to be the qualitative information which is received and not the more precise quantitative data. However, energy auditors must have a comprehensive understanding of all aspects of house design, including construction practices, heating and ventilation systems, occupancy use characteristics, indoor air quality as well as a thorough knowledge of energy conservation practices.

SCANDINAVIAN ENERGY STANDARDS



by David Olivier

In SOLPLAN REVIEW 4 we compared current and proposed energy standards in Canada and the Northwestern United States. But how does this compare with what others are doing? We have recently received a report on activities in Scandinavia that we think will be of interest to our readers.

With Sweden in the lead, the trend throughout the Scandinavian countries is to well insulated, airtight buildings, incorporating forced ventilation to maintain indoor air quality. The question now seems to be not whether energy use in buildings will drop dramatically, but how long it will be before new houses require zero space heating energy.

Many new developments are assisted by work in the National Building Research establishments. The annual research budget for building research in Sweden is around $45 Million, of which over 50% goes to energy related work. (The budget of the Division of Building Research of NRC is $12.9 million. Energy related work was virtualy eliminated in the recent cutbacks).

In the Stockholm area, a typical new house now uses less energy for space heating than for water heating. In the early 1970's, an average new 130 m^2 house required 60-80 GJ/year for space heating. Today, comparable new houses require 15-20 GJ/year. (An R2000 house in Prince George B.C. requires 25-30 GJ/year).

New Swedish standards for single family houses due to be introduced in 1985 will require new buildings to be superinsulated. Even Norway, which has energy in abundance, and which stands to be an energy exporter for 100 years, has stringent energy regulations.

Table 1 lists Scandinavian energy standards compared to those of the R2000 program in Canada.

TABLE 1: COMPARISON OF ENERGY STANDARDS (RSI units) (CANADA VS SCANDINAVIA)

	R2000 (CANADA)	SWEDEN	NORWAY	NORTH-WEST UNITED STATES
WALLS	3.5	5.88	4.	3.4 - 5.5
ROOF	–	8.3	4.34	6.7
GLAZING	DOUBLE	TRIPLE	TRIPLE	TRIPLE
AIRTIGHTNESS	1.5 ACH @50 Pa	3 ACH* @50 Pa	4 ACH @50Pa	

ACH = air changes per hour
* May be changed to 1 ACH @ 50Pa

PROBLEMS AND SOLUTIONS

The rapid move towards well insulated, airtight houses in Sweden has had some problems, though they have been well researched and in many cases overcome.

A number of single family houses built in the 1970's had severe condensation and mould problems. These were slab-on-grade houses, built before the importance of forced ventilation was recognized. Poor workmanship in the floor dampproofing allowed water to evaporate into the living spaces. Building regulations requiring mechanical ventilation to provide .5 air changes per hour were designed to overcome such risks.

A recent study has found that a mechanical fresh air input of .2-.3 air changes per hour was adequate for good air quality in new airtight, timber frame houses, provided the mechanical system is properly designed and balanced to ensure fresh air to different rooms. Only in dwellings with radon problems, would .5 ac/hr or more be generally necessary.

Another problem noted has been condensation in roofspaces. In pitched roofs with attic floor insulated, thin, non-UV-stabilized polyethylene showed rapid deterioration in under a decade of use. This allowed upward air movement by natural stack effects from the dwelling into the roofspace where moisture could condense.

It has also been noted that ventilating outside the insulation does not seem to prevent condensation. Given a tight vapour barrier, it may not be necessary.

Non-ventilated tiled roofs are approved for new construction. This is especially convenient for insulated sloped ceilings, where an air space need no longer be provided between the mineral wool and roof covering. A number of such dwellings are being monitored. Preliminary results indicate that the roof timbers settle down to a 15% moisture content, which is considered satisfactory.

Most people in Sweden believe that the problems with increased insulation and air tightness levels have basically been solved, and the only difficult issue remaining is ventilation. Although 100% of new Swedish dwellings now have mechanical ventilation, there are two systems in use: balanced ventilation, with supply and exhaust ducts, and exhaust ventilation with one exhaust duct and air inlets in every room (below windows or other convenient locations).

The energy requirement of balanced ventilation can be reduced by use of heat recovery ventilators. That of exhaust ventilation can be reduced by using a heat pump to recover heat from the outgoing air for use in water or space heating. This latter system seems to be gaining popularity. However, exhaust ventilation systems have generated complaints about draughts.

Balanced ventilation with heat recovery gives better comfort conditions and allows a smaller heating system, but needs airtight construction. Balanced systems have given problems due to incorrect balancing of air flows. In addition, HRV units with temperature efficiencies in the 60% range contribute poor energy savings relative to simple exhaust ventilation.

The feeling is that there is a need for improved worker education, better quality hardware and more careful installation and adjustement for balanced ventilation systems to fulfill their energy saving potential.

New building regulations have been introduced with remarkably few problems. Costs for better insulation and airtightness have consistently been less than predicted by the construction industry.

Swedish prefabricated housing manufacturers (who build 80-90% of all houses) now claim to be making well insulated, airtight houses (.4-.6 ac/hr at 50 Pa), with triple glazed windows for the same cost, in real terms, as fairly leaky houses 5-10 years ago.

In Denmark, even though it has a less severe climate, energy consciousness is almost as high as in Sweden. Most houses now built far exceed insulation levels required by regulations; most meet Swedish standards.

In the past few years, even though there are no regulations, whole dwelling mechanical ventilation systems with heat recovery have become common.

Recent tests on airtight houses have indicated that people still have a very poor understanding of how mechanical ventilation/heat recovery systems work. Only 20% of homeowners in a 70 unit development bothered to read a 10 page explanatory booklet.

Another study measured room by room air change rates. It found that periodic window opening in an otherwise airtight house at winter temperatures and windspeeds hardly reduced indoor relative humidity levels. This emphasizes the need for constant, reliable, raised ventilation rates offered by forced ventilation systems.

David Olivier is with Energy Advisory Associates, Milton Keynes, England.

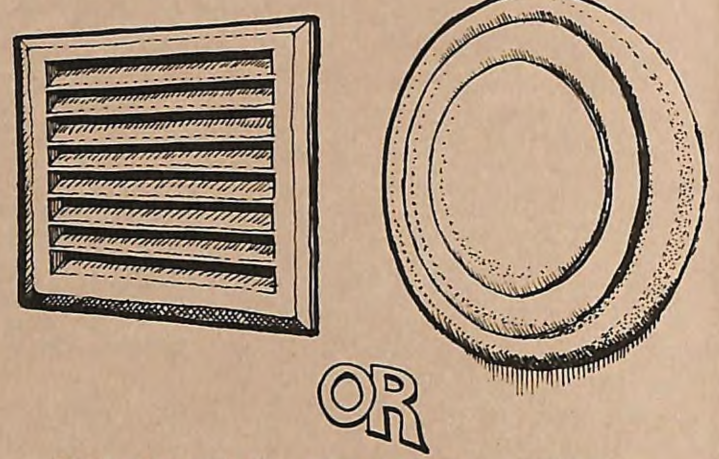
REPRINTED...

A National Catalogue of Residential Energy Conserving Products and Services. We first reviewed this publication in issue 1 of SOLPLAN REVIEW, but as the first printing was small, all copies disappeared fast. It has now been reprinted. Unfortunately, it has not been updated, so a few entries are incorrect. Still, it remains a valuable reference source.

This catalogue presents information about materials and services which are applicable to low energy housing, both new construction and retrofit. The primary audience for this publication are the builder/contractor and building supply house. It will equally be of use to architects, designers, specification writers and owner builders.

Copies are available for $3.00 from local R2000 Coordinator's office. (If an office is not accessible to you, forward your request to SOLPLAN REVIEW, along with $1.50 to cover postage & handling).

GRILLES & DIFFUSERS



Today's quiet, comfortable, energy efficient airtight homes require mechanical ventilation systems to maintain indoor air quality. Central ventilation systems use heat recovery ventilators to allow air exchange without losing too much heat. Such systems employ two streams of air.

Stale air is exhausted from the house, picked up in the service rooms (bathrooms, kitchens, utility area). Exhaust air grilles are ideally located in the ceiling or high on a wall.

Incoming fresh air can be mixed and then distributed by a central forced air heating system, or it can be supplied direct to living areas (bedrooms, living rooms), independent of a heating system. This direct ducting system is the standard layout used in non-forced air homes (radiant heating systems).

Unless the fresh incoming air is preheated or mixed with room air (after it's been heated in the HRV) it does not reach indoor temperatures before it is delivered to the living space. For this reason, it is important to supply this air at a high wall or ceiling location for maximum effectiveness and minimum discomfort. The cooler air is slightly heavier than the room air, so it will tend to fall and mix thoroughly without creating a pool of cool air at the floor. The small volumes of air will not create uncomfortable cold drafts.

The standard grilles used in such low volume ventilation systems are 3"x10" floor registers used in hot air heating systems. As they are located high on a wall, they occupy a visually prominent position. To improve their appearance, they are often painted to match the wall.

Standard floor type grilles have some shortcomings.

Floor registers are 'see-through', which means they are also transparent to sound. They will allow HRV fan sounds as well as noises in adjoining rooms to enter directly.

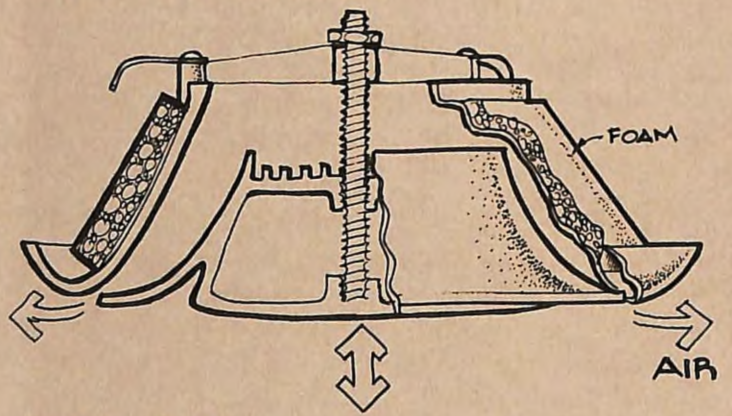
Floor grilles were designed for air flows in the 40-80 cfm range. Their adjustable dampers are not accurate enough to control air flows in the 10 cfm range, which is what a typical HRV system delivers. As a result, critical duct sizing is required to ensure proper balance in the system.

At low air volumes, the diffusion qualities of floor grilles are poor. This can cause noticeable drafts.

Because they were designed for floor locations, the shape and appearance of the registers is often unacceptable, even if painted to match the wall.

The shortcomings of these grilles can be overcome by specialy designed grilles and diffusers that are now being developed. One such design, a moulded plastic profile now manufactured in Sweden, is being imported into Canada.

These grille units by design are not see through. They have a sound deadening reverse side which consists of a soft foam pad and a ridged profile. Much greater room by room privacy is provided. In many cases HRV fan noise is eliminated, thus avoiding the need for special duct silencers or mufflers.



Ceiling Diffuser

These units can reduce the ductwork needed as the need for long independent duct branches (for sound privacy) is eliminated.

In earlier systems, sizing of branch ductwork and choice of fittings more than adjustability of grilles determined air flow to specific rooms. These grilles are infinitely adjustable - allowing them to be fully opened or closed. As long as sufficient branch capacity is supplied, no other special precautions are required to be taken to ensure balance.

Perhaps technically the most significant advantage of the supply diffusers is their ability to mix the cool fresh air into the room without creating a draft. The circular pattern of the ceiling diffuser, and the narrow conical patern of the high wall location fitting help direct air flow in the direction desired, thus ensuring that fresh air is mixed with the room air before it falls to the 6 foot level (the occupied zone). In the ceiling unit, the air is channeled horizontally - it resembles a miniature ceiling air conditioning diffuser commonly seen in commercial buildings. The wall unit directs air straight out, allowing it to mix with room air as it starts to spread.

A major plus of these grilles, aside from their technical advantages, is their neat appearance.

R2000 TECHNICAL REVISIONS

The R2000 technical requirements are being revised. The new standards are to be released February 16, 1986, when new Builder's Manuals will be released.

A significant proposed change is the reduction of the air change rate required from .5 air changes per hour to .4 ACH.

If implemented as proposed, the technical requirements are sure to frighten and anger most builders.

The original R2000 technical requirements concentrated on reducing seasonal heating loads. How this was achieved was left up to each builder's ingenuity, using local materials and expertise. It was a performance standard. New regulations are increasingly becoming more prescriptive.

The draft we have seen underlines the institutionalization of the program: it contains several pages of references to technical standards and procedures (as in the building code). It's probably certain that just like the building code, most builders do not have access to the standards, nor have they ever seen any of them.

If the document comes out looking like a catalogue of CSA and ASHRAE documents, SOLPLAN REVIEW will translate it into common English.

MARKETING R2000

At long last, a massive national promotional campaign for the R2000 progam has been launched. Full page, 4 colour ads are appearing in a few national publications. The theme of the ad is "R2000: A Home For All Seasons".

Apparently, market research has indicated that while many Canadians are familiar with the R2000 slogan, few know what it actualy stands for. Regretably, the ads don't do much to further public understanding.

A major oversight in the ad is an address or phone number for follow up. There was no coordination with local R2000 Coordinators. They could have at least piggy-backed local or regional contact addresses for appropriate follow up.

The ads ask for interested persons to "contact a local builder". What is the percentage of builders who are committed to the R2000 (or Super Energy Efficient House) concept? There are still far too many builders not convinced of the need and advantages of building to R2000 standards. (Otherwise, why are there so many workshops planned for this spring, with no end in sight of interested people wanting to attend?).

We wonder how many unsuspecting members of the public, intrigued by the ads, will approach their "local builder" only to be talked out of building to R2000 standards? Unfortunately, most of the larger, high profile builders are not yet converts to low energy building.

Another area of concern is the choice of publications in which these ads are appearing. Noticeable by their omission are several large circulation magazines featuring homes and lifestyles - periodicals prospective homeowners evidly read, such as Homemakers, Chatelaine, Harrowsmith and Western Living. Instead, several travel oriented magazines received ads: enRoute (Air Canada), and Westworld.

Did anyone really plan how those millions of dollars are being spent?

HRV TESTING UPDATE

The Ontario Research Foundation carried out the first standardized tests on Heat Recovery Ventilators a year ago. A second round of tests was scheduled almost immediately, as a result of several shortcomings in the original test procedures. The results of this second round have been promissed ever since.

A significant feature of the new tests is that they simulate prolonged cold weather testing: 72 hours continuous operation with an outside temperature of -25°C.

At long last, some results have begun to trickle out.

Only units that meet these new stringent standards are allowed for use in R2000 houses after December 1, 1985. However, only 2 units have undergone the testing required and meet these standards:

Air Changer DR275
VanEE 2000

You may ask what's happened to the other 10 or so HRV's on the market. The word is that several other units are currently undergoing testing, so there should be several others on the list soon. In the next issue of SOLPLAN REVIEW we will compile the available results.

However, just because a unit doesn't make the list does not mean that it is totaly worthless. Installed in an appropriate manner, it may well provide completely satisfactory service.

Some manufacturers have held off testing as they are making further design modifications to their units. The $8000 cost of testing makes it extremely costly for manufacturers to test thier units each time they are modified, especially as the market is still quite small. As a result, we suspect that design improvements will be slow in coming once a unit has been tested and approved by the R2000 program.

HRV INSTALLER CERTIFICATION

The latest set of HRV Certified Installer training courses are being organized. These sessions are designed for trades personnel. Eligible attendees, after completing the course examination, are certified to install HRV's. Certification is a requirement of CSA standards, and will be required in future R2000 installations.

The list of dates and locations of courses was still being finalized at press time. There are over 30 sessions planned for before the end of March. If you or your trades are considering attending, we would urge you to call today to obtain details about the sessions in your area.

For registration details, or more information, contact the HRAI directly. They can be reached (toll free) at:
1-800-268-2702

LETTERS TO THE EDITOR

Sir,

I appreciate your factual, non-commercialized approach. Your article on heating systems is straight forward and sensible and I like the educational explanations, for example on conduction, convection and radiation.

I have built several R-2000 homes and the main problem is the least expected one - fan motor noise. The other problem is intake of smoke from neighbouring chimneys. I have used a charcoal filter but it does not give a complete solution.

In R-2000 building, it seems that many are too eager to jump on the bandwagon of technology and are too concerned with new products and processes. It's hard enough to educate the public on what's been done so far, let alone lose them in a jungle of new ideas and experiments. Their confidence is low and they're afraid that what's touted as new and innovative will soon be obsolete. The report that we were given on the R-2000 test results was positive. So what has been done so far works, and the only problem of real concern is for example the vapour barrier durability, why not correct the problem at its source? Surely the use of greenhouse poly or the upgrading of standards for residential poly is more practical, more economic, and more within reach than the long and expensive process of not only development of but acceptance of new processes.

The public awareness of and demand for R-2000 housing was growing. Without the modification of the R-2000 program using readily available and generaly accepted building practices, the R-2000 house seems to have been lost to the public in a cloud of technological experiments, giving an impression of increased costs with no guaranteed results.

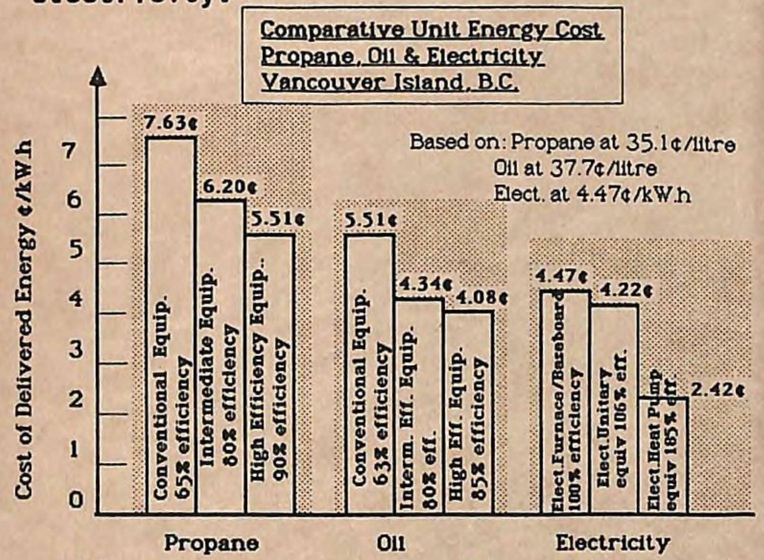
That's my view as a small builder, but I don't see small builders making much difference without the public relations needed as a result of a well coordinated R-2000 program operating on practicality for the present, not on technological dreams for the future.

Alan Davidson, President
Loring Homes Ltd.
Comox, B.C.

Sir,

I believe there are a couple of errors in Issue 4 (September 1985).

Under disadvantages of electric heating, it is stated that electricity results in higher operating cost than other fuels. In fact, electricity is a lower cost fuel than oil or propane and can even be competitive with wood in many cases. The enclosed bar chart and graph illustrates respective energy costs. Natural gas is not included on the bar chart as it is less costly than electricity.



The next statement is that a larger panel and service is required. This isn't always the case, as it is often possible to install 7 to 9 kW of electric heating on a 100 amp service and this is enough for many energy efficient homes.

There is a statement that the Energy Use Engineering Department has been eliminated. While technically correct, I think it would be more appropriate to say it has been reorganized into two groups - Industrial Energy Management and Residential & Commercial Energy Management. The latter group will be carrying on with the programs and studies on energy efficient housing, albeit with a reduced staff.

It is also true that we are promoting the sale of electricity, but always on the basis of <u>wise</u> use. As you know, electricity is a wise choice for space and water heating in energy efficient housing.

You mention the old Gold Medallion Program; this was, in fact, one of the earliest energy efficient housing promotion progams I know of. In those days, housing was built with R7 in the walls and R12 in the attic. Gold Medallion recommendations were R12/R20, which is a fair improvement. Our new program, Double E, which in essence carries the old Gold Medallion concept to new heights, has been so successful in some parts of the province that it is now considered to be the standard for insulation levels for any fuel. B.C. Hydro therefore has had a long involvement with energy efficient housing, has worked hard to earn a high degree of credibility in this field and will strive to maintain it.

G.H. Pinch, P.Eng.
Residential & Commercial Energy Management, B.C. Hydro

VENTILATION & FORMALDEHYDE

In 1983 a monitoring program to evaluate indoor air quality and ventilation systems studied all initial R2000 houses and a sample of conventional control houses. The control houses were recently built houses by R2000 builders using similar building materials as R2000 homes, but not constructed to R2000 insulation, airtightness and ventilation requirements.

The study found that average formaldehyde levels were virtually identical for R2000 and control homes in the first year, and well below Health and Welfare Canada guidelines (0.1ppm). Repeat testing the second year indicated that formaldehyde levels in conventional homes were 16% higher than in R2000 houses.

On average, ventilation systems were sized to the R2000 program criteria of .5 ac/hr but most systems were not balanced. Only 16% of the ventilation systems were balanced within the 10% as required by current standards. Subsequent work to balance the system may at times result in modifications to equipment or ductwork in order for the systems to meet program criteria.

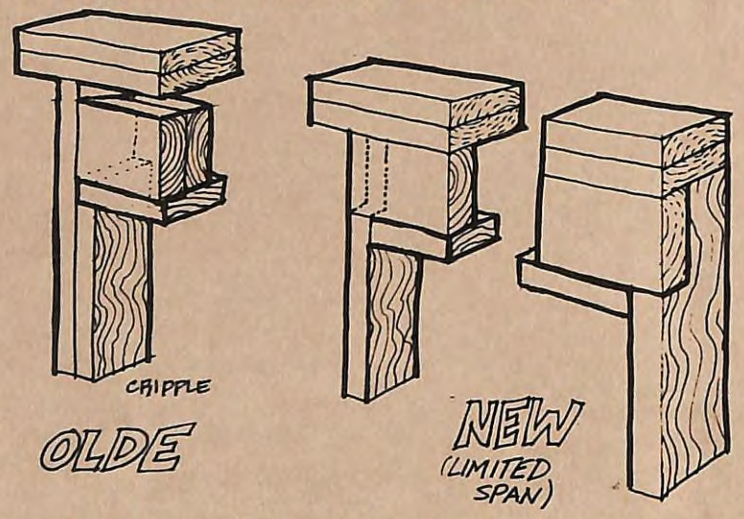
Formaldehyde is a chemical substance

commonly used in building materials and household products (including cigarette smoke). Individuals show varying tolerances to formaldehyde gas; while many experience no negative effects even at high levels, others are sensitive to low concentrations. At high levels, it can cause eye, nose and throat irritation or respiratory problems.

Continued monitoring will take place on a number of these houses during the 1985/86 winter, to see if formaldehyde levels drop over time.

A number of changes in R2000 program technical requirements have already been made to reflect some of the findings found in this study, including the requirement that fresh air supply be provided to each room.

ALTERNATE FRAMING METHODS



A number of builders in the Okanagan Valley of B.C. have begun using a new method for framing window and door openings in 2x6 stud walls.

The 2x6 stud on either side of the opening is notched to receive a 2x10 single header (for spans up to 5') and a double 2x10 for larger spans. Maximum allowable spans would depend on loading conditions on the framing.

The benefit of this detail is that for smaller windows it allows for more insulation in the header space. Wall cavity thermal bridging is reduced, as there is only a single stud.

This detail is structurally sound, and saves on labour and material costs, by eliminating cripples on either side of the opening. Building inspectors in the Okanagan valley have been approving such framing details.

BOOKS

<u>MODEST MANSIONS: Design Ideas for Luxurious Living in Less Space</u> by Donald Prowler. Published by Rodale Press

In an age when the ghetto blaster is being replaced with the walkman, it makes sense to reexamine the old question, "how much space does a person need?". This paperbound book presents the case for the modest mansion with remarkable clarity. When page 9 illustrates neat piles of the basic materials (foundations excepted) which comprise the typical American dwelling unit, the author uses a brilliant device to give the reader a feel for the issues involved. This book is filled with similar coherence.

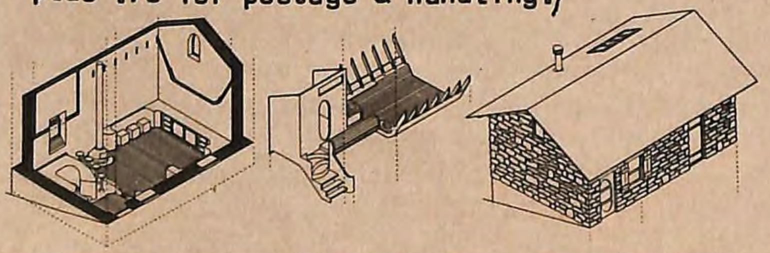
Homebuilders having the means to hire an architect tend to produce large houses. Consequently, the architectural mind generally does not deal with small houses except as academic exercises. Prowler has documented the best in contemporary compact architecture but has extended the scope of his investigation to include everything from the igloo to space age high-tech autonomy.

Designs are illustrated with clearly drawn exploded-view isometrics at a standard scale. You don't have to be able to interpret blueprints to imagine your way around the examples and compare them.

<u>Modest Mansions</u> also contains key information for the layperson to use in visualizing either a retrofit or a new home. Special attention is paid to equipping the reader with a feel for critical dimensional standards. Building codes are touched lightly and only in an American sense although one of the house examples is Canadian.

Energy conservation and luxury are combined in this delightful book. It should be required reading for every client who introduces the commission with "I'm tired of cleaning a big house" or similar complaint. As grandad used to say, a four room house is too big for a three person family. Check this one out.

(Available from The Drawing-Room. $15.95 plus .75 for postage & handling.)



R2000 WORKSHOPS

A new round of R2000 seminars is about to take place. Dates and places are tentative. Those interested in attending a workshop should confirm details with the local coordinator.

Update Seminars: a requirement for builders who wish to maintain their R2000 status.

BRITISH COLUMBIA
For registration, call: 604-732-1222
2-DAY BUILDER WORKSHOP:

VANCOUVER	JAN 17/18
CRANBROOK	FEB 27/28
QUESNEL	MAR 6/7
KAMLOOPS	MAR 20/21
TERRACE	EARLY MAR

1 DAY PUBLIC SEMINAR:

QUESNEL	MAR 8
KAMLOOPS	MAR 22

1 DAY BUILDER UPDATE:
(DATES TO BE CONFIRMED)

VANCOUVER	LATE FEB/EARLY MAR
PRINCE GEORGE	LATE MAR

MANITOBA
For registration, call: 204-477-5110
2 DAY BUILDER WORKSHOPS:

WINNIPEG	JAN 16/17
BRANDON	JAN 23/24

1 DAY BUILDER UPDATE:

WINNIPEG	JAN 15

ONTARIO
For registration, call: 416-229-2111
2 DAY BUILDER WORKSHOPS:

OTTAWA	JAN 6/7
TORONTO	JAN 14/15
KINGSTON	JAN 22/23
CHATHAM	FEB 18/19
KITCHENER	FEB 25/26
LONDON	MAR 4/5
OTTAWA	MAR 11/12
TORONTO	MAR 18/19
SUDBURY	APR 2/3
THUNDER BAY	APR 9/10

At the begining of February there will be a 1 week instructor's workshop in Toronto. Attendance at this session is strictly by invitation. Those who would like to become R2000 instructors should talk to their local R2000 coordinator.

February 16, revised R2000 Builder's Manuals will be available.

NEXT ISSUE:

* How would you feel if you go to the market and order (and pay for) a 2 kilo roast, only to find when you get home it really is only 1.5 kilos? This is exactly what may be happening with your insulation purchases! There are indications that the R-value ratings claimed by insulation manufacturers and installers are overstated, but they get away with it because you can't easily measure it. In future issues we will be examining this issue.
* Other items we are working on for coming issues include Gas heating systems for energy efficient houses.
* Plus more news about new products, news, and much more. Be sure not to miss any issues. If you are not a subscriber yet, SUBSCRIBE TODAY!

MARKETING IDEAS

AIRTIGHT CONTRACT

Many look-alike R2000 houses are being built now. However, if they are not built within the program, what certainty does a buyer have that the house will meet the criteria for an energy efficient, high quality and safe home? A HOTCAN simulation showing that a plan meets the requirements only indicates the potential to meet R2000 or SEEH standards if built properly.

Airtight construction techniques are a critical component of low energy houses. Houses may be well insulated, but if not tightly built, will not have the full benefits of tight construction.

Sheltair Scientific Ltd., a Vancouver air-testing company, has developed a simple, one page standard contract form. Used in conjunction with a standard building contract, it will ensure that the house meets good low energy building standards.

The contract includes simple statements that the builder is responsible to use airtight construction techniques and will arrange for an air leakage test on completion of construction.

Performance specifications are spelled out: "the building must measure less than 1.5 induced air changes per hour at 50 Pascals depressurization".

The guarantee for the customer is that "if the house fails the test, the builder will forfeit $2000." If additional airtightening work is undertaken by the builder (at his expense), and further pressure test proves that the house achieves the 1.5 air changes per hour, the builder will receive the holdback.

If a builder choses to build a house outside of the R2000 program, and many are, then similar contract language should be used in the contract. It will provide assurance to the homeowner that the house does indeed conform to current low energy standards. No contractor familiar with low energy construction techniques should have any problems with such a qualifier.